CprE/SE 491 Weekly Report 22

Dates: 10/26/2017 - 11/1/2017

Dec1709 - ALVINN

Autonomous Vehicle Mission Processor with Machine Learning

Team Leaders:	Bijan Choobineh	**Advisors:**	Dr. Jones & Dr. Zambreno
	Darren Davis		
Communicator:	Tracy La Van	**Client:**	Josh Bertram - Rockwell Collins
Key Concept Holders:	Jesse Luedtke		
	David Schott	**Email:**	dec1709@iastate.edu
Webmaster:	Robert Stemig		alvinn@iastate.edu

Weekly Summary:

This past week we took a look at what we have done so far this semester. We have several neural networks that partially work to our satisfaction and we are trying to decide which one we should pick or if we should use three of them and do various metric testing on all of them. A quick summary of what we have done so far is below:

Currently, our raw data is coming from 'Flight Gear' flight simulator. We are able to stream pictures and video from it to our board using GStreamer. We have a DetectNet network on the board, which detects aircraft in images. It does this by using a moving window approach across the image and then using ImageNet to get confidence levels for objects in the window. We are still in the process of testing; however, we are able to detect a good amount of data coming from both random test images as well as Flight Gear data.

Our main issue is streaming video into our network at the moment. We have done a good amount of testing and have been able to stream video into another network (without the GPU enabled); however, we are unable to do it with the DetectNet system. After searching the Internet, we made the discovery that other people have had this issue , and similar issues, with no resolution to date. A secondary issue with DetectNet is the size of the bounding box around the airplane is not always accurate and sometimes places a box around the entire screen.

After several weeks of working with DetectNet for streaming video unsuccessfully, we looked into YoLo and Tiny YoLo. YoLo gave us an error that made us believe there were memory issues (it was possibly too large) and Tiny YoLo did not do a good job of detection. We had some success with Google MobileNet SSD; however, it uses TensorFlow which is not readily compatible with the TX1 board (we could spend time in figuring out how to download this, but at this point we are thinking it is something we should not concentrate on). We are successfully able to run this SSD on a CPU though. There is a possible version that is a Caffe implementation of Google MobileNet SSD that we can try on the board and there is a modified version we may be able to debug.

Past Week Accomplishments:

- **Darren, Jesse, David, & Bijan:** Tested FlightGear with different models to see how well different aircraft are being detected. Worked on resolving issues with the throughput(FPS) of some networks.

- **Darren and Jesse:** Tried MobileNets-SSD on the TX1 as we know the speed of this network acceptable on cpu but still had issues. We think we are only running in CPU mode and not GPU.

- **Bijan Choobineh:** Worked on updated FlightGear models as well as scripting with it. Drawing out and working on the poster for senior design.

- **Darren Davis:** Worked with team members on items listed above. Researched performance issues we are having for ways to resolve them, these include speed of some networks and bounding box issue with DetectNet.

- **Tracy La Van:** This past week was mainly spent on paperwork for the class and more research into neural networks.

- **Jesse Luedtke:** Configured FlightGear for testing our models such as adding multiple aircraft to a scene.

- **David Schott:** Worked on installing Caffe-SSD while debugging encountered compatibility issues. Then did some preliminary testing on image/video files, and webcam.

- **Robert Stemig:** Collecting more specified FlightGear images for testing of the different networks on the board.

Pending Issues:

- **David Schott**: Performance issues with processing from video feed need to be resolved. Neural networks that are considered very performant only achieve 8-9 FPS with GPU enabled.

Plan for Coming Week:

- **Bijan, David, Robert:** Begin working on poster requirements.

- **Darren, Tracy, Jesse:** Begin working on the final report.

- **Bijan Choobineh:** Completing a poster first draft. Working towards the final report. Get a final scripting environment setup for demoing and testing. Create more formal testing plan.

- **Darren Davis:** Continue looking into resolving problems and start running test comparing different networks. Start looking at final report.

- **Tracy La Van:** Will work on helping Darren figure out testing requirements and start working specifically on the neural network section of the final report to provide detailed information on our trial and errors with the various networks.

- **Jesse Luedtke:** Echoing video input while our models and OpenCV process the latest frame.

- **David Schott:** Will work on investigating performance issues and making Caffe-SSD models work with GStreamer.

- **Robert Stemig:** Will help resolve issues with Caffe.

Individual contributions:

NAME	Individual Contributions	Hours This Week	Cumulative Hours
Bijan C.	FlightGear Scripting, Poster, FlightGear Testing	6.0	39.0
Darren D.	Initial test of FlightGear and trying to resolve issues.	10.0	87.5
Tracy L.	Weekly Report, Hw1, Final Report, Neural networks	7.0	45.0
Jesse L.	FlightGear testing and configuring, running MobileNet-SSD on the NVIDIA board	7.0	67.0
David S.	Installing Caffe-SSD, troubleshooting issues, and running models on different data sources.	11.0	61.0
Robert S.	FlightGear image testing	5.0	47.0
	Totals:	46.0	346.5

Summary of Weekly Advisor Meeting (10/27/2017):
   Zoom: https://zoom.us/j/7680301181
   - Cancelled by Dr. Jones

Summary of Weekly Client Meeting (10/31/2017):
   Zoom: https://zoom.us/j/757821200
   - Cancelled by Josh Bertram

Summary of Weekly Team Meeting (10/31/2017):
   Zoom: https://zoom.us/j/393292249
   - Weekly Reports
      - WR21: Everyone but Darren, David & Tracy have empty spots
      - Don't forget to do WR22
   - HW1 submitted

- Someone needs to send Josh a comprehensive email about our progress
- David is running into issues with Caffe
- Network Summary
  - DetectNet: Streaming Issues & bounding box issues
  - YoLo: possible memory issue
  - Tiny YoLo: did not detect well
  - SSD (on MobileNet): Uses TensorFlow - not compatible with TX1 board
    - [Caffe Version](#)
  - Another version of SSD working but processing slowly
- Testing? What will we do about testing?
  - CPU to GPU
  - Resolutions
  - Speed vs. Accuracy
- Worst-Case: Skip TX1 and run on CPU for demo
- Pictures in Google Drive